

WHAT IS CLAIMED IS:

1. A method of metering a volume of crystallizing agent for crystallization comprising:
 - providing a chamber having a volume in an elastomeric block separated from a control recess by an elastomeric membrane;
 - supplying a pressure to the control recess such that the membrane is deflected into the chamber and the volume is reduced by a calibrated amount, thereby excluding from the chamber a calibrated volume of a crystallization sample.
2. The method of claim 1 further comprising:
 - providing the crystallizing agent to an opening of the chamber; and
 - ceasing application of the pressure such that the membrane relaxes back to an original position and the calibrated volume of the crystallizing agent is drawn into the chamber.
3. The method of claim 2 wherein the crystallization sample is a protein solution such that drawing the crystallizing agent into the chamber changes a solubility of the protein.
4. The method of claim 1 further comprising the parallelization of multiple chambers with varying calibrated volumes.
5. The method of claim 1 further comprising the use of a parallel structure to rapidly determine optimal conditions for crystallization.
6. A system for crystallizing a target material comprising:
 - an elastomeric block including a microfabricated chamber configured to contain a volume of a solution of the target material; and
 - a microfabricated flow channel in fluid communication with the chamber, the flow channel introducing a volume of a crystallizing agent into the chamber.
7. The crystallization system of claim 6 further comprising an isolation structure, the isolation structure configured to selectively isolate the chamber from the flow channel as the flow channel receives a volume of crystallizing agent, and then to place the chamber into contact with the flow channel to alter a solution condition within the chamber.
8. The crystallization system of claim 6 wherein the volume of crystallizing agent is determined by a dimension of the flow channel.
9. The crystallization system of claim 6 wherein the volume of crystallizing agent is determined by a length of the flow channel.

10. The crystallization system of claim 6 wherein the volume of crystallizing agent is determined by a width of the flow channel.

11. The crystallization system of claim 6 further comprising a control channel overlying the chamber and separated from the chamber by a membrane, the membrane deflectable into the chamber to exclude a calibrated volume of sample solution from the chamber, such that relaxation of the membrane draws the calibrated volume of the crystallizing agent into the chamber.

12. The crystallization system of claim 6 further comprising:
a plurality of first parallel flow channels in fluid communication with a target material; and

a plurality of second parallel flow channels orthogonal to and intersecting the first flow channels to create a plurality of junctions, the second flow channels in fluid communication with a crystallizing agent such that an array of solution environments can be created at the junctions.

13. A system for crystallizing a target material comprising:
an elastomeric block including a microfabricated chamber configured to contain a volume of a solution of the target material; and
a crystallizing agent reservoir in fluid communication with the microfabricated chamber through a dialysis membrane, the dialysis membrane configured to prevent flow of the target material into the crystallizing agent reservoir.

14. The crystallization system of claim 13 wherein the crystallization reservoir is formed in a second elastomeric block.

15. The crystallization system of claim 13 wherein the dialysis membrane is present within the elastomeric block.

16. The crystallization system of claim 13 wherein the dialysis membrane comprises a polymer that is introduced between the chamber and the reservoir and then subjected to cross-linking.

17. The crystallization system of claim 13 further comprising an intermediate solution imposed between the chamber and the reservoir to mediate diffusion of crystallizing agent into the chamber.

18. The crystallization system of claim 17 further comprising a second dialysis membrane imposed between the intermediate solution and the reservoir.

19. A method for crystallizing a target material comprising: charging a chamber of a microfabricated elastomeric block with a volume of solution of the target material; and

introducing a volume of a crystallization agent into the chamber to change a solvent environment of the chamber.

20. The method of claim 19 wherein the volume of crystallizing agent is introduced into the chamber by deforming an elastomer membrane overlying the chamber to exclude the volume of the sample from the chamber, followed by relaxing the membrane to cause the volume of a surrounding crystallizing agent to flow into the chamber.

21. The method of claim 19 wherein the volume of crystallizing agent is introduced into the chamber by entrapping a volume of crystallizing agent proximate to the chamber, and then opening an elastomer valve positioned between the chamber and the crystallization agent to allow diffusion of crystallization agent into the chamber.

22. The method of claim 19 wherein the volume of crystallization agent is introduced into the chamber by diffusion across a dialysis membrane.

23. The method of claim 19 wherein the chamber is defined by a junction between a first flow channel orthogonal to a second flow channel, and wherein the sample is flowed through the first flow channel and the crystallization agent flowed through the second flow channel.

24. The method of claim 23 wherein an array of chambers is defined by a junction between a first set of parallel flow channels orthogonal to a second set of parallel flow channels, and wherein samples are flowed through the first flow channels and crystallization agents are flowed through the second flow channels to create an array of solution conditions.

25. A method for crystallizing a target material comprising introducing a crystallizing agent to a target material solution in the presence of a surface having a morphology calculated to serve as a template for formation of a crystal of the target material.

26. The method of claim 25 wherein the surface is a surface of mineral substrate exhibiting a regular morphology.

27. The method of claim 25 wherein the surface is a surface of semiconductor material exhibiting a morphology defined by features patterned by lithography.

28. A method for crystallizing a target material by vapor diffusion comprising:

providing a target material solution within a microfabricated chamber;

providing a recrystallizing agent in fluid communication with the microfabricated chamber;

providing an air pocket between the chamber and the recrystallization agent, such that the crystallizing agent diffuses in the vapor phase across the air pocket into the target material solution.

29. The method of claim 28 wherein the air pocket is formed by trapping air during charging of the chamber with target material solution and introduction of the recrystallizing agent.

30. The method of claim 28 further comprising creating a hydrophobic material in contact with the air pocket, the hydrophobic material preventing target material solution and crystallizing agent from displacing the air pocket.

31. The method of claim 30 wherein the hydrophobic material is created by microcontact printing an underlying substrate.

32. The method of claim 30 wherein the hydrophobic material is created by flowing a hydrophobic fluid through a junction between the chamber and the crystallizing agent to leave the hydrophobic material as a residue.